EEEE1039 Applied Electrical and Electronic Engineering: Construction Project

Coursework 2019/2020

23 March 2020

This coursework is to develop an algorithm for face recognition in digital video using CodeBlocks integrated with OpenCV.

Hardware

For video recording: could be smart phone, computer with a camera, digital camera, etc.

For image processing: your own computer installed with CodeBlocks integrated with OpenCV.

Software

CodeBlocks integrated with OpenCV. Other software or custom packages are **NOT** allowed to be used in your coursework. Libraries allowed to be used in your coursework should be only from CodeBlocks and OpenCV.

The tutorials for the installation of CodeBlocks and how-to-integrate-OpenCV-with-CodeBlocks are provided in the following links.

On Windows OS:

https://zahidhasan.github.io/2017-03-25-How-to-install-OpenCV-3.2-in-windows-10-using-MinGW-(64)-and-Codeblocks/

https://www.youtube.com/watch?v=9Ira7lTKpbs

https://www.youtube.com/watch?v=G9IBIEDex18

On Mac OS:

https://www.youtube.com/watch?v=37RvqZVddAw

Original video requirement

The original video refers to the video that you shoot for the purpose of face recognition, using your smart phone, computer or any other device, before any processing using CodeBlocks + OpenCV.

Size: <= 50MB, no requirement on the minimum size of the video

Duration: 20 seconds. In the first 10 second of the original video, you need to:

- face directly at the camera with your front image in the center of the frame;

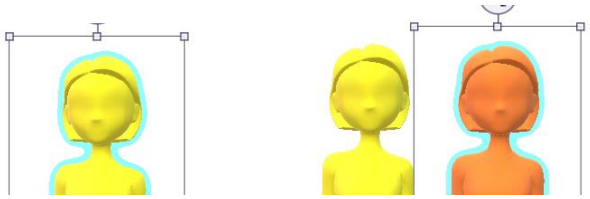
- turn your head 90 degrees to the left and the right, respectively;
- face directly at the camera again, then shift your front image from the left edge of the frame to the right edge of the frame.

In the second 10 second of the original video, the requirements are:

- two persons face directly at the camera with both front images in the center of the frame, while one person is yourself and the other person is someone you invited;
- these two persons swap their location with their front faces to the camera.

Animations showing sample videos are presented in the MS PowerPoint file "***Coursework Introduction 19/20***". The sample videos break the 20-second video into 2 10-second videos, for the purpose of slide demonstration. However, your original video should be only **ONE** video with a duration of 20 seconds.

Video requirement



0 – 10 seconds **10 – 20 seconds**

Task

1. Install CodeBlocks + OpenCV on your own computer, the installation tutorials are provided in this file.
2. Process the 20-second original video using the libraries in CodeBlocks and OpenCV, custom defined libraries are not allowed.
3. The algorithm for face recognition should be template matching technique. The templates for your program are selected by yourself.
4. The target to be recognized in the video is yourself only, excluding the other person, meaning that the templates for your program are the images of yourself only while the images of the other person are not necessary.
5. The video after processing, i.e. the processed video, should identify yourself in the first 10 seconds, and distinguish yourself from the other person in the video in the second 10 seconds, by displaying use-friendly messages. The figure below shows a sample of the processed frame, e.g. with your name displayed by your face and "unknown" displayed by the face of the other person.

If there is no face available for recognition, a proper message should be displayed, e.g. “No Target”, “No Capture”.

6. Plenty of resources about face recognition are available online, do include the references in your report using the correct format.

Your_Name

Your_Name

Unknown

Submission

The submission deadline **is 6pm, 10 April 2020** via Moodle assignments. Late submission results in a mark deduction of 5% of the coursework report mark per working day. The submission components are listed below, and there will be specific submission link for each component on Moodle.

Submission components:

- Coursework report. This coursework should be a full report, presenting the face recognition algorithm, the results and proper discussions etc. The report should be **no more than 30 pages** excluding references/appendix. A deduction of 10% mark of the coursework report mark will be conducted on report with over 30 pages excluding references/appendix.

- C++ program. This program should be the final program, which can generate the same video as processed video you submit to Moodle using the same original video you submit to Moodle, i.e. the processed video can be regenerated using the submitted code and the submitted program.
- Original video. The 20 second original video you use in this coursework.
- The processed video. The video generated by the C++ program.
- Template(s) and any other document(s) required by your program.

Questions

Please answer the following questions in your report in the “result and discussion” part. Proper examples generated by your C++ program should be given in answering the following questions.

1. For the template matching algorithm you use, what are the application restrictions?
2. What are the factors that would affect the recognition accuracy?
3. How do you find the proper similarity to be considered as a “match” to template?